

Standardized Canister and High Integrity Can Deployment

Tom Hill

September 17, 2001

Packaging Objectives

- *Provide standardized canister(s) designs to simplify handling of DOE SNF during interim storage, transportation, and disposal at the repository*

Canister Drivers

- *Memorandum of Agreement (MOA) for Acceptance of Department of Energy Spent Nuclear Fuel and High-Level Radioactive Waste between the Assistant Secretary for Environmental Management and the Director of the Office of Civilian Radioactive Waste Management, Rev. 1, January 1999*
- *NSNFP decision to develop standardized canister to simplify handling of DOE SNF and resultant cost savings of handling operations at multiple sites and at repository*
- *Robustness of standardized canister key to licensing strategy*
- *Integrated Interface Control Document, Volume 1, DOE/RW – 051, being updated*

Standardized DOE SNF Canister



- *Developed to be single package used by DOE Complex*
- *Robust performance*
- *Maintains containment under accident conditions*
 - *New canister testing completed*
 - *Future aged/degraded canister testing*
- *Full scale testing and validation of analytical models*
- *Compatible with storage, transportation and disposal plans*

Drop Testing at Sandia National Laboratories

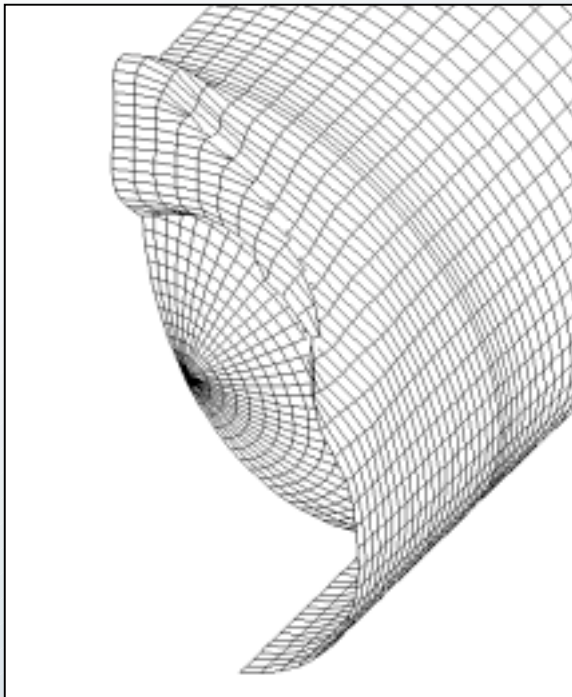
Providing for safe, efficient disposition of DOE spent nuclear fuel

Accomplishments

- *Continued scientific investigation to justify drop analysis methodology*
 - *Continued analysis of drop results*
 - *Performed friction drop tests*
- *Continued pursuing ASME Code changes*
- *Continued support to Foster Wheeler contract*

1998 Drop Test: Actual vs. Modeled

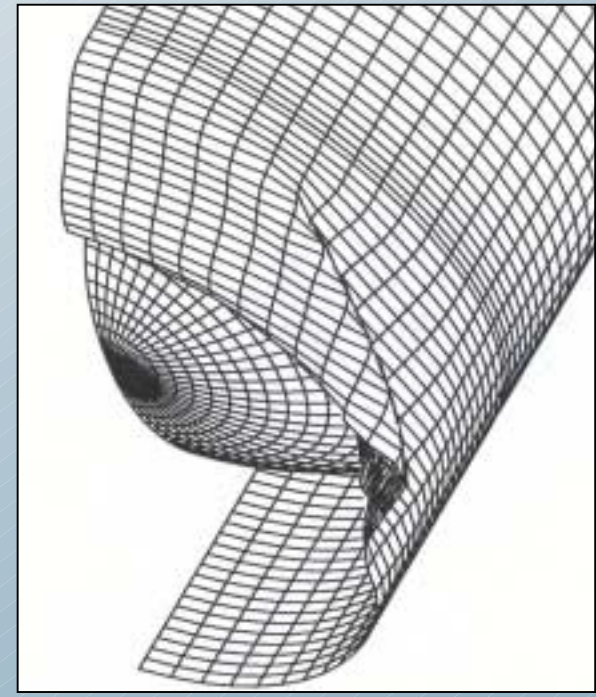
*Predicted Deformation
Using 0.4 Friction Factor*



Actual Deformed End



*Predicted Deformation
Using 0.1 Friction Factor*



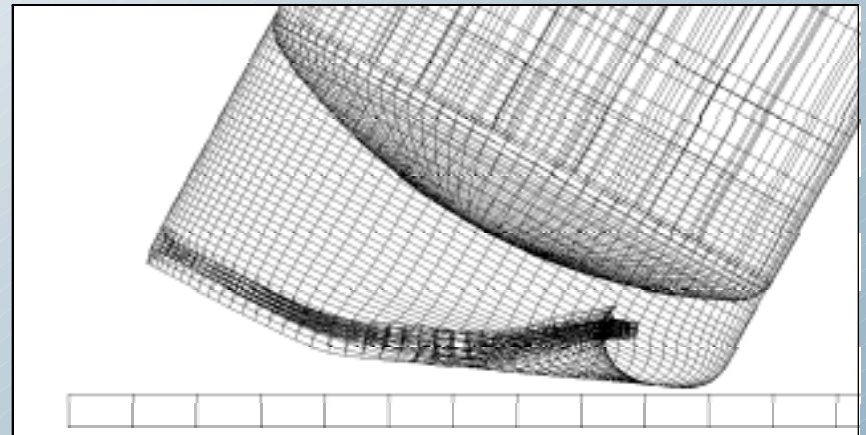
Proposed Solution

- *Initiate Friction Parameter Drop Tests*
 - *Investigation to drop identical test specimens*
 - *Drop at a variety of impact angles*
 - *Determine the friction parameters that yield the best analytical matches to the actual deformations of the test specimens*
 - *Not redefining coefficients of friction but establishing an analysis methodology*

Best Match Is With A Low Friction Value (21° Impact Angle)

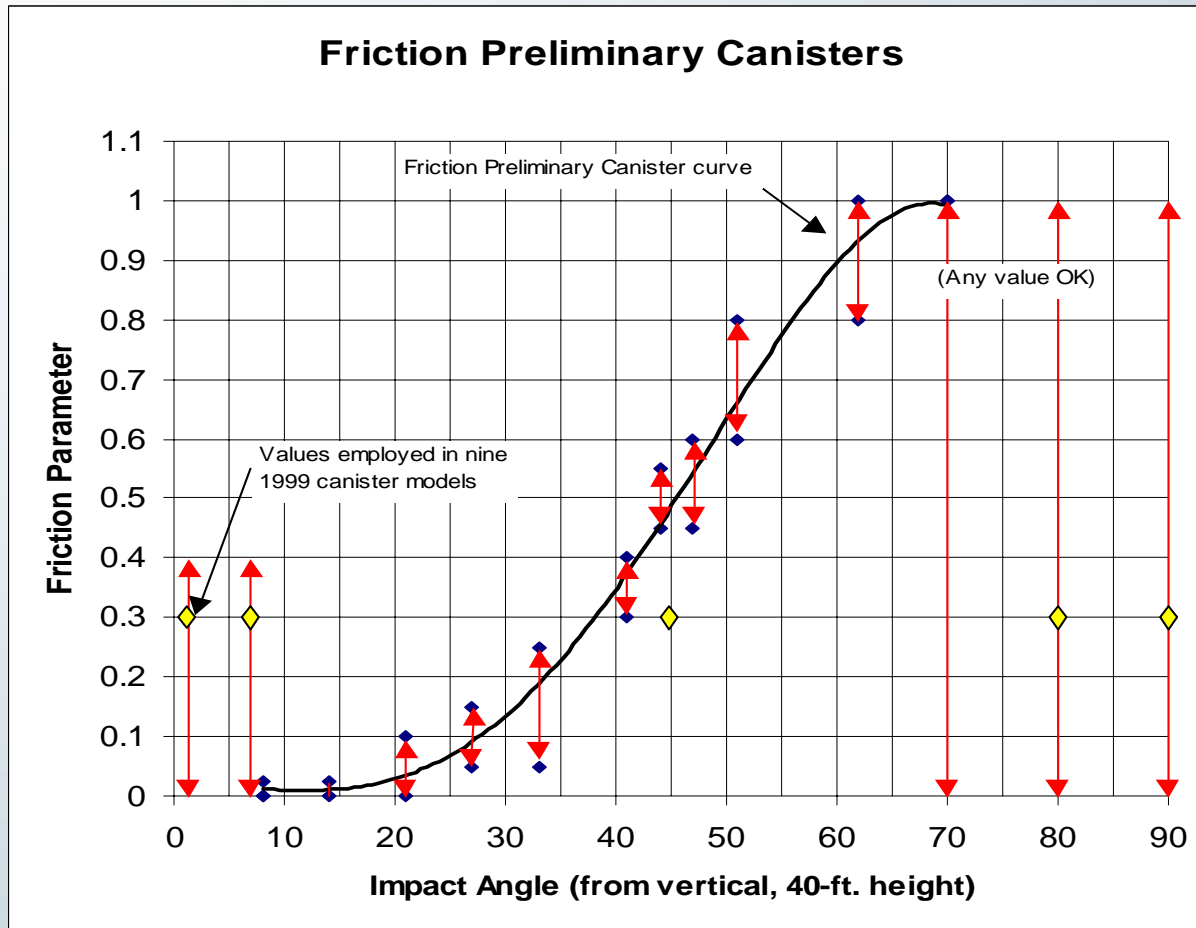


Actual Deformed Test Specimen



Friction Value of 0.05

Preliminary Results To Date



Significance of Results

- *Demonstrated that standard analytical procedures may yield incorrect results if a wrong friction value is used*
 - *Analysts must be aware of this effect*
 - *Analysts can determine applicability regardless of item design by varying friction values*

Significance of Results (cont.)

- *Demonstrates to the NRC that DOE understands the canister performance during drop accidents*
- *Significant breakthrough for analytical techniques of structural behavior in high plastic/elastic strain situations*
- *Validates design analysis techniques for slight variation to standardized canister design*

Friction Parameter Test Specimen - Flat Bottom



Status of ASME Code Changes

Change	Reason	Passed NUPACK	Current Status
Allow Field Operations	Final closure weld can be made at the loading site.	Yes Revised Subsection WA	Issued July 2001 (typo being corrected)
Alternate Stamping Requirements	N-stamp is valid after acceptance of final closure weld.	Yes Revised Subsection WA	Issued July 2001
Allow Ultrasonic Testing for Weld Examination	UT instead of radiography can be used for final closure weld examinations.	Yes Revised WB-5279	Issued July 2001
Allow Leak Testing in Lieu of Pressure Testing	Option of helium leak testing can be used.	Yes but held by NUPACK Chair to coordinate with new Subsection WC	Expedite new Division 3 Code Case, before main committee

Standardized Canister Documentation

- *Preliminary Design Specification for DOE Standardized Spent Nuclear Fuel Canisters, Vol. I & II, DOE/SNF/REP-011, Rev 3, August 20, 1999*
- *Hydrogen Damage in DOE Spent Nuclear Fuel Packages, DOE/SNF/REP-019, August 30, 2000*
- *Interactions of DOE SNF and Packaging Materials, DOE/SNF/REP-020, September 30, 1998*
- *Advanced Neutron Absorbers for DOE SNF Standardized Canisters – Feasibility Study, DOE/SNF/REP-057, August 30, 2000*
- *Design Considerations for Standardized DOE SNF Canister Internals, DOE/SNF/DSN-019, In process*
- *Design Requirements and Usage Guidance for the Standardized Department of Energy Spent Nuclear Fuel Canisters, DOE/SNF/DSN-017, In process*

High Integrity Canisters



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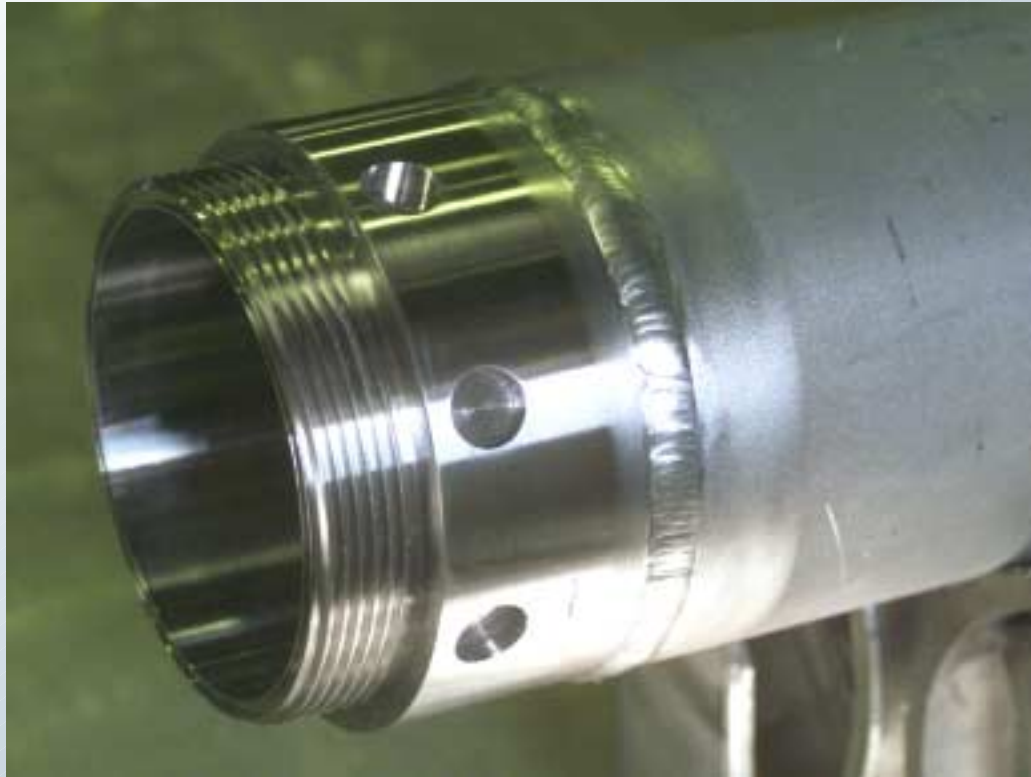
High Integrity Can (HIC)

- *Developed for handling and packaging of failed fuel*
- *Material - Hastaloy C-22*
- *Designed to withstand 30 ft drop*
- *Removable screw on lid*
- *Seal leak rate less than 10^{-4} cc/min*
- *Demonstrated HIC closure function*
- *First HIC complete by 11/30/01*
- *First HIC for packaging sectioned INEEL TRIGA rods at ANL-E*

Fabrication of HIC



Completed Weld Prior to Cover Pass Cleanup



HIC Assembly Prior to Pressure Testing



Lower Head for Leak Testing (to be replaced)



HIC Prototype Closure Test Fixture



HIC Prototype Closure Torque Testing



HIC Prototype Closure Testing



HIC Documentation

- *High Integrity Can Design Interfaces, DOE/SNF/DSN-001, August 31, 1998*
- *High Integrity Can Design Input Document, DOE/SNF/RD-004, September 30, 1998*
- *High Integrity Can Material Selection and Design Data, DOE/SNF/DSN-002, April 30, 1999*
- *High Integrity Can (HIC) Design Drawings, DOE/SNF/DSN-003, April 30, 1999*
- *High Integrity Can Stress Analysis Report, DOE/SNF/DSN-004, April 30, 1999*
- *High Integrity Can Independent Review, DOE/SNF/DSN-011, April 30, 1999*
- *5 3/8 – Inch HIC Leak and Pressure Test Observations and Insights, EDF-2864, In process*